ST/ECA/ATRCW/82/10

Workshop Report Series

WORKSHOP FOR TRAINERS AND PLANNERS ON APPROPRIATE TECHNOLOGY FOR THE RURAL FAMILY

Bo, Sierra Leone

ECA/ Government of Sierra Leone/ UNICEF/Voluntary Fund for the United Nations Decade for Women

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A field visit to Nyamgbebu Village.

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The secretaries and duplicating machine operators.

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The participants, for their friendly co-operation.

I. INTRODUCTION

The Workshop for Trainers and Planners on Appropriate Technology for the Rural Family for participants from Anglophone West Africa was held from 13 to 23 November 1979 at the Bo National Training Centre, Sierra Leone. It was the first of two such workshops to be held in West Africa. The Workshop was conducted in collaboration with the Ministry of Social Welfare and Rural Development. The Ministry has developed a number of projects related to the improvement of technologies in rural areas. Some of these projects were visited by participants during the course of the Workshop.

Dr. Marilyn Carr, Economist at the Intermediate Technology Development Group (ITDG) and former Appropriate Technology Officer of ECA/ATRCW was consultant for the Workshop. Ms. Abeba Wolderufael of UNICEF Nairobi, was resource person on Karen Appropriate Technology Demonstration Centre. UNICEF West Africa was represented by the Programme Officer for Sierra Leone.

The Workshop was attended by participants from five Anglophone West African countries - Gambia, Ghana, Liberia, Nigeria and Sierra Leone, and consisted of three categories of participants, namely technologists, planners and policy-makers and organizers of women's programmes.

Over the past four years, the African Training and Research Centre for Women (ATRCW) of the Economic Commission for Africa had conducted a series of workshops for trainers and planners to improve the quality of rural life in individual African countries. A major recommendation from most of these workshops had been the need to identify and implement projects and programmes aimed at introducing simple technologies to improve the life of the rural woman and her family.

With respect to these recommendations and to ECA's programme of work, the Centre's village technologist visited several of the interested countries to assist with identification and implementation of village technology projects and programmes. During these visits, many professional workers, especially in the West African countries, expressed their interest in the possibility of a workshop specifically on village technology.

Accordingly, ECA/ATRCW organized this workshop on Appropriate Technology for the Rural Family.

The main objectives of the workshop were:

1. To assist groups of member States to bring together planners, trainers, technologists and others engaged in development and dissemination of appropriate technologies for exchange of experiences relating to problems and successes of introducing simple technologies into villages in their respective countries;

2. To broaden participants' knowledge of technologies available and schemes used to disseminate them in other countries in Africa and in other parts of the world; and,

3. To identify needs of rural women and families in individual countries which could be met by improved technologies, so as to recommend projects in each country aimed at introducing such technologies.

During the meeting the topics discussed included:-

(a) The concept of appropriate technology and intermediate technology linking it with social, economic and technical considerations.

(b) Present day policies and programmes of appropriate technology in Africa.

(c) The relative merits of improving existing technologies and transfer of technologies.

(d) The work and life of rural women in Africa and areas of priorities which affect their lives. Specific problems of rural families in the participating countries and how the introduction of appropriate technology can assist.

(e) Major priority areas on which work needs to be initiated.

(f) Appropriate technology programmes and pilot projects in Africa with specific reference to work of UNICEF, ECA, ILO, ITDG and other organizations.

II. OPENING SESSION

The ECA/ATRCW Workshop for Trainers and Planners on appropriate technology for the Rural Family was opened on 19 November 1979 by the Honorable Alhaji S.H.O. Gborie, Minister of Social Welfare and Rural Development, Sierra Leone. In his address the Minister said that he felt the Workshop could enhance production processes geared at increasing living standards.

While technology is rapidly becoming the norm in developed countries, he said, those developing countries have tended to rely too much on the importation of foreign technology, some of which has not been readily adaptable to Africa.

This tendency, if allowed to continue, he noted, would not only adversely affect the countries' way of life, but it would also in the long run exhaust meagre foreign exchange holdings. The President of Sierra Leone has counselled his people to intensify their self-help activities in the pursuit of self-sufficiency especially in the area of staple foods.

In this regard there was need to utilize basic natural resources by the use of intermediate technology, coupled with labour intensive inputs.

Among the advantages of the use of intermediate technology in rural areas, he pointed out that:-

(a) Considerable foreign exchange would be saved in the long run if local raw materials from the rural areas could be processed by simple technological means, instead of relying on imported products or machinery.

(b) It would increase the productive capacity of rural inhabitants, generate more funds, increase local distribution and exports, provide incentives, create employment avenues in the rural areas, and promote a higher standard of living.

(c) It would abate migration from the rural to the urban areas in search of means of livelihood.

In this context Sierra Leone has advocated a back to the land movement. Efforts have been made to study the possibilities of updating traditional production processes, which could be used as a base to build improved methods. The various technological processes were being studied and evaluated. The criterion of what is the most appropriate technological process for the society should be made optional to the people, he said, with due regard to their needs and the requisite inputs.

The Government of Sierra Leone was anxious for the success of the Workshop, he noted, because its objectives were in accord with Government policy.

Other participants in the opening session were Ms. S.J. Taylor, Social Development Officer, Bo District; the Honourable Harold Hanciles, Resident Minister, Southern Province; and Ms. R. Dakowah, organizer of the Workshop on behalf of ECA/ATRCW.

III. WORKSHOP DELIBERATIONS

Election of Officers

The following officers for the Workshop were unanimously elected:

Chairman	-	Mrs. L. Foh, Sierra Leone
Deputy Chairman	-	Professor E. Eastman, Liberia
Rapporteurs	-	Mrs. Yvette Stevens, Sierra Leone
		Mrs. S. Singhateh, The Gambia
		Mrs. A. Beecham, Ghana

Adoption of Agenda

After discussion and modification an agenda was adopted. It was agreed that the Secretariat would arrange a tour of Bo town.

The rapporteurs were to provide a day-to-day summary report of the proceedings to help in the final evaluation and in the preparation of the Workshop report.

ECA Presentation

The ECA organizer Mrs. Rose Dakowah described the activities of the ECA/ATRCW, particularly those relating to the theme of the Workshop. She reviewed the activities and responsibilities of rural African women and the factors which impede their progress. In view of these factors the ECA was sponsoring projects and programmes geared towards aiding the rural family. She mentioned some projects currently underway (e.g. the palm oil press project in Sierra Leone, the grinding mill project in Upper Volta and the water supply project in Ethiopia).

She highlighted areas in which ECA can provide assistance, viz:-

- Pilot Projects;
- Socio-economic Studies;
- Survey of Traditional Techniques; and
- Training and Scholarship.

The ATRCW, she said, acted upon requests from governments, member States of the ECA.

Discussion followed on the matter of availability of loan facilities for women. On the whole, it was stated, there were no discriminatory laws against women in obtaining loans. Traditional prejudices, sociological and other factors, however, make it more difficult and sometimes impossible for women to produce collateral required by funding agencies.

Presentation of the Intermediate Technology Development Group

Dr. Marilyn Carr, Consultant to the Workshop and Economist at the Intermediate Technology Development Group (ITDG, London), spoke on technologies appropriate to the rural women in Africa. (Her paper appears in Annex III.) Dr. Carr stressed the concept of appropriate technology, noting the factors that brought about the idea of devising appropriate technology for rural people who form 30 per cent or more of the population of African countries. She compared extreme types of technology which have been and are being used that did not serve the maximum needs of the users, e.g. the traditional hoe and the modern tractor. In view of these extremes, she said, a more appropriate technology should be developed. Equipment should be produced that is efficient in terms of production saving time and labour and which was accessible to rural people in terms of cost and repair. Therefore, some technology between these two extremes - an intermediate technology, could be appropriate. An example was the animal plough which could be made locally, at less cost than the tractor, and which could be more productive than the hoe. Similarly she cited other trades and activities in which appropriate technologies could be devised. She highlighted the following areas in which devices could be developed:

1. Water collection - Hand pumps, water catchments, windmills;
2. Collection of firewood - Improved stoves, solar cookers, methane stoves;

3. Food production - Seeders, weeders;

4. Crop processing equipment - Grinding mills, etc.;

5. Income-generating technologies - Candle making, chalk making, basket making, etc.;

3. Home improvements - Water filters, pit latrines.

There are existing devices in all these areas which are not being utilized by the rural people because of certain constraints. Some of these constraints included:-

1. Lack of easy access for women to credit and cooperative facilities.

2. Lack of training for operation, repair and maintenance of equipment.

3. Insufficient consideration in matching technologies to needs.

4. Insufficient consultation with end users when designing technologies.

5. Insufficient attention given to implications of the scale of technology.

After discussion it was agreed that the following be added to the list of constraints.

3. Resistance to change.

7. Lack of co-operation between extension workers and technologists and among extension workers.

3. Lack of information about technologies.

It was noted that power through machines which required expensive diesel fuel would be inappropriate, power from natural resources like wind and water could be utilized to advantage.

Women, it was agreed, should not be treated in isolation, since sociological factors in Africa dictate that for any scheme to succeed, consideration must be given to the woman as part of a family unit. Men and children should therefore be involved in programmes designed to improve the lot of women.

By saving time spent on unproductive tasks, the woman in the rural area would have more time to spend on leisure, to improve her education, and to look after the children.

Policy of the Government of Sierra Leone on Appropriate Technology

Mrs. Rosalind O. Forde, Chief Social Development Officer, Ministry of Social Welfare, and Rural Development, explained the policy of the Sierra Leone Government in regard to appropriate technology. She stated that the policy for rural technology is to provide solutions for the improvement on tasks performed in the

traditional manner, thus encouraging communities to be self-reliant.

In practice, she said, rural technologies in Sierra Leone have helped to expand new economic and social as well as traditional activities so that surplus labour could be released for other activities. The traditional activities she named were:

(a) Food production

(b) Food processing

(c) Home crafts

(d) Marketing

Sierra Leone's policy on appropriate technology tries to ensure that women are given the opportunities to make use of newly introduced technology so as to increase their productivity, thus closing the gap between the earning capacity of men and women.

She pointed out the multidisciplinary nature of appropriate technology as a continuous development process. A project in appropriate technology, she said, could generate other activities, since women could then find time to engage in functional literacy, home crafts, home improvement, nutrition, personal and environmental hygiene.

The main emphasis in the Ministry of Social Development in the area of appropriate technology, she said, was on those devices which are effort saving, and of real use to village people. Sierra Leone emphasises technologies to improve village water supplies, produce more efficient but simple implements, simple domestic appliances and better housing.

In Sierra Leone's efforts to bring about change in the life of the rural population, she informed the meeting of a national survey conducted in 1978 with the aim of identifying indigenous technologies in Sierra Leone with a view to embark on ways of improving their efficiency and productivity. The survey revealed the need for technological improvement which would not only create job opportunities but create a more self-sufficient infrastructure in rural areas. Technologies identified in the survey include palm oil pressing, nut cracking, gari processing, fish preservation, soap production and local gin production. In this connection the Engineering Faculty at Fourah Bay College had been approached to develop simple hand-operated oil presses which were now being tried in various parts of the country. (The survey has been published under the title Indigenous Technology in Sierra Leone, and copies are available from ECA/ATRCW, Box 3001, Addis Ababa, Ethiopia.)

She spoke of the importance of collaboration between field workers and technologists, and she pointed out the problems of imported raw materials as regards appropriate technology.

In the discussion which followed it was observed that activities pertaining to social welfare are usually given second priority in national development and considering the importance of appropriate technology as regards improving and developing the socio-economic standard of the rural family, it is, therefore, necessary that policy-makers and planners should reorient themselves to such activities and

readjust their policies and plans to enhance social welfare efforts. In this connection it was suggested that officers in this field should try to convince planners of the benefits of welfare programmes, especially those programmes whose benefits can not be easily quantified.

Aspects in the Implementation of Appropriate Technology - Role of the Faculty of Engineering, Fourah Bay College

This presentation was made by Dr. M.W. Bassey, outlining the technical aspects of the implementation of technology appropriate to rural communities and the efforts being made in this regard at the Faculty of Engineering, Fourah Bay College. He elaborated the main stages in an implementation programme that are vital to the success of the technology:

(a) Survey of indigenous technologies existing at rural level.

(b) Research and development work in laboratories.

(c) Field-testing.

(d) Widespread dissemination.

Dr. Bassey described projects being undertaken in the Fourah Bay College, Faculty of Engineering, including solar water heaters, solar dryers, indigenous fuels, charcoal-fired steam engines, fish smokers, solar stills, small-scale hydro and wind power generation, electrical insulating and earthing materials, local building materials, and transportation. (His paper appears in Annex III.)

In the discussions which followed, Dr. Bassey said, that as yet no work had been done to investigate the utilization of the by-products of the preparation of wood charcoal. Palm kernel shells were used as fuel by blacksmiths, and this source was to be fully investigated.

It was stressed that co-ordination of the work done in different countries was necessary if duplication of efforts was to be avoided. With the meagre resources available in our countries means of effective dissemination of information must be devised. It was observed that even though organizations like UNIDO publish journals on appropriate technology, the literature or appropriate technology being circulated was far from adequate.

There was some argument as to whether regional centres of appropriate technology would solve the problems of lack of information and co-ordination. One school of thought was that national centres with regional links might be a better solution to the problem. Study tours were considered vital, in either case.

On the question of funding of projects, Dr. Bassey informed the participants that obtaining funds was not always easy, since funding agencies generally require that some basic work had been done on a particular topic. Sometimes members of staff of the Faculty had even had to spend their own money to develop the first prototypes.

In order to ensure the support of governments, technologists were advised that in the initial surveys, priority areas can be identified from the national development plan.

Role of Women's Organizations: Sierra Leone

Mrs. Lucy Foh, representing the Ministry of Social Welfare and Rural Development, reminded the participants that technologies were not always machines. She stressed the need to develop technologies to ease the lot of the rural woman.

Women's organizations could play a vital role in promoting appropriate technology, and equipment for women could be introduced through members of women's organizations, she said. Feedback on performance and acceptability could be communicated to these organizations.

She introduced one simple device which could be utilized by women in cooking - the haybox cooker. The 'Cooker' consisted of a wooden box with hay insulation. The food (rice or beans) is boiled on a fire for about fifteen minutes and then transferred to the haybox and covered. The insulation conserves the heat and keeps the food boiling. Unfortunately, she could not give any concrete figures as regards time and quantities as she had not had time to do comprehensive tests. Such a device she explained, would save firewood and would leave the woman free to perform other chores.

Mrs. Foh observed that since doner agencies prefer to fund organized groups, women's groups were an advantageous choice for the dissemination of appropriate technology.

Tikonko Agricultural Extension Centre: Bo, Sierra Leone

Mr. Bob Moran of the Tikonko Agricultural Extension Centre gave a brief history of this Centre and highlighted some of the implements being produced and developed there. Among these were rice threshers and winnowers, cassava graters, blowers for blacksmiths, well pumps, seeders, wheelbarrows and hand tools.

The production unit at the Centre has facilities for carpentry, blacksmithing and arc-welding. There are eleven people on the production staff. Their main objective, he said, was to stimulate local industries to produce these implements. One of the biggest problems encountered to date has been publicity for the Centre and its products. Agricultural shows have been used but found ineffective.

Participants suggested that information about the Centre be sent to the Ministry of Social Welfare or the Ministry of Agriculture for publicity. Demonstrations could be made to agro-technicians at the training schools. Mr. Moran said that the Centre had plans to use the mass media for publicity and a member of the staff would concentrate on this.

Providing engines to drive the equipment developed has proved expensive, he said. A petrol engine would considerably increase the cost of this equipment. This is where the small charcoal-fired steam engine being designed by the Faculty of Engineering, Fourah Bay College might prove useful.

Co-ordination with other sectors of the community was once again stressed as an important factor at all stages of development.

Work of the Co-operative Department: Sierra Leone

Mr. A.M. Jalloh, a representative from the Co-operative Department, Sierra Leone, explained the Department's activities. Co-operatives, he said, were institutions which, properly guided and utilized, can play an important role in the development of both rural and urban communities. Activities covered by the co-operative societies included agriculture, savings and loans, and consumer products. In the last ten years women have formed their own co-operatives in arts and crafts, thrift and credit. The co-operative movement was now anxious to explore possibilities of using appropriate technology devices in the rural areas. Co-operative societies possess great potential for disseminating and implementing appropriate technology, since they provide a good system of communication in their meetings, courses, and seminars. Very little had been done to date by the Co-operative Department in Sierra Leone on available appropriate technologies due to lack of information.

To qualify for co-operative loans, a member has to be up-to-date with his subscriptions (which range from 20c to Le1.00 monthly) and two other members within the group must act as guarantors. The co-operative societies can raise loans from the co-operative bank at 15 per cent interest where subscriptions are not adequate to meet the members' demands.

Guidelines to Government of Liberia Policy in Relation to Rural Development

Professor Eric Eastman of the University of Liberia (Monrovia) started by discussing how the Government of Liberia identified problem areas in rural development through a socio-economic survey which revealed that most rural people were engaged in agriculture, were generally illiterate, had little or no access to technology, and that national wealth was distributed inequitably.

Objectives of Rural Development Programme

Based on the survey the following objectives were established:

1. Provision of appropriate training and educational facilities;
2. Provision of adequate health care;
3. Provision of appropriate technology facilities;
4. Diversification and equitable distribution of wealth; and,
5. Total involvement of people in development efforts.

The next step was the formulation of plans to achieve these objectives simultaneously using a multisectional approach.

Some constraints encountered in implementing the plan were:

(a) Economic - lack of funds to carry out projects;

(b) Social - lack of quantitative and qualitative data about needs of target beneficiaries;

(c) Geographic - some of the villages were isolated and hard to reach.

The rural family was helped to use its resources to improve its life, and this involved the development of technological devices. He stressed that care should be taken that the technology being introduced really benefited the women they were intended to help.

Activities of the Home Economics Extension Department in the area of appropriate technology were briefly outlined. They included weaving and soap making, as well as areas to improve home and family; in this connection the department worked closely with ministries such as health which help provide facilities like toilets and clinics to improve family health.

Some of the major problems that the Home Economics Extension Department faced in implementing its programme were:

(a) An attitude on the part of rural people that all the help they received should be free;

(b) Their lack of formal education which hindered the adaptation and maintenance of innovations; and

(c) Economic constraints - the cost of equipment purchased.

The problems both of introduction and sustaining use of new technologies were formidable.

In the discussion that followed, it was felt that more co-operation was needed between technologists, top government officials and policy makers and the development planners in the introduction of new technology.

Appropriate Technology in the Gambia

In the Gambia the majority of agricultural projects are based mainly on rural technological innovations to aid rural development so that these innovations may eventually become integral parts of their social system. He suggested areas that needed to be considered before the introduction of appropriate technology, as follows:

(a) Definition of objectives;

(b) Study of the existing traditional system;

(c) Testing of proposed improved methods;

(d) Consideration of the socio-economic implications of newly-produced equipment.

During the past five years ox ploughing has been considered the most appropriate type of farming considering the implications of tractor mechanization. Ox-ploughing schools have been designated mixed farming centres where intensification and diversification of farming, crop rotation and new techniques are taught to farmers. Exchange of technologies between the Gambia and Senegal has helped in determining suitability of equipment. The sine hoe, a one-wheel multipurpose high-performance tool frame and a single-row seeder for planting groundnuts and cereals widely used in the Gambia have been identified in this way. A post-harvest crop storage system is being constructed with mud brick walls, plastered inside and outside with cement and covered with corrigated aluminum sheets.

Women as well as men in the rural areas have to be trained in line with the new technologies in order to achieve maximum benefits. For technologies to meet the needs and demand of the rural family, they must be time-saving, easy-to-use, repair and maintain and acceptable to the community.

Production of 90 per cent of Gambia's population living in the rural areas is very low due to such factors as:

(a) Inefficient equipment;

(b) Inadequate skills in the various trades;

(c) Inaccessibility to financial and material resources and technical assistance;

(d) Ignorance of the available facilities; and

(e) Poor physical health.

The Gambia Government's strategy in this regard is to develop appropriate technologies related to social and economic development, starting with the dissemination of information on technologies and proceeding to the technologies themselves. Aware of the social implications of innovations the Government has included in the development programmes socio-economic research on on-going projects that involve life-style changes. A major programme in primary health care has been launched; it aims to provide appropriate health services for every member of the rural population, utilizing as much as possible the human and material resources of the local communities, and thus making services more accessible to the communities. Primary health care will include environmental sanitation, clear water supply, improved maternal and child care and functional education for better health. Such health programmes are run in close relation to agricultural programmes which identify crops and agricultural operations in which women constitute the major source of labour and where they could be helped by training, access to credit, and improved implements for increased production and processing of food crops.

Some rural development workshops have been established in the Gambia to facilitate the transfer of simple mechanical and engineering skills which will contribute towards the maintenance and repair of agricultural tools and equipment. The new Gambia National Vocational Training Centre will be completed in 1981; among its activities it will train trainers to devise tools and equipment necessary for prevailing economic conditions. At present the Directorate of the National Vocational Training is examining the trades and productive activities in the Gambia with the aim of devising simple time-saving and productive technologies which can be used in

various fields.

Activities of the Appropriate Technology Unit - Department of Community Development, The Gambia

The Appropriate Technology Unit in the Department of Community Development has been promoting use of the bucket stove. This came about after Government placed on embargo on tree-cutting for wood and charcoal. The bucket stove uses groundnut shells as fuel.

Another introduction the Unit has promoted is the use of clay, in place of mud, for making bricks. Clay bricks are heated with baobab strings for extra enforcement. The clay bricks could be used in building houses and asbestos for roofing. This method could replace the mud house and grass roof and the expensive cement-brick house with aluminum sheet roofing.

Activities of the Federal Department of Rural Development, Federal Ministry of Agriculture, Nigeria

The principal aim of this Department is to promote development of agricultural projects. It provides support and guidance to states within Nigeria in the identification, preparation and appraisal of projects and coordinates activities of various projects. The Department has five on-going agricultural development or integrated development projects, and feasibility studies are being carried out for two new ones.

The Department seeks to increase agricultural productivity and incomes of the rural people, thus improving the standard of living in the rural areas by providing improved agricultural technology (improved seeds, fertilizers, pesticides, training in animal husbandry, credit and assistance for mechanization and basic infrastructural development and social services (feeder roads, year-round water supplies, consumer shops and simple health facilities). Implementation of this scheme is through farm services centres. Projects are financed by the state Governments, the Federal Government and loans from the World Bank. The Department monitors the projects, reporting to the Federal Government on the progress of project activities.

Ghana

Four papers on aspects of appropriate technology in Ghana were presented. The first paper was presented by Dr. Ampratwum, Senior Lecturer and Head of the Agricultural Engineering Department, University of Ghana, on "The promotion of Technology for Improvement of Rural Life in Ghana", (see annex III for the full text). He gave an overview of work done in appropriate technology in Ghana and the establishments which have been involved in developing, constructing and introducing these devices.

He listed some of the household devices and their uses developed both for the home and the community. He further outlined research and development work done in Ghana on dryers and graters as well as equipment and structures for farm and the innovations involved in this.

Dr. Ampratwum stressed the fact that almost all the establishments involved mount extension and training programmes to facilitate the adaptation of the devices and ensure proper utilization. He ended by stressing the need for co-operation and co-ordination in the context of a national rural technology programme.

National Council on Women and Development

The second paper was a report on the work of the National Council on Women and Development in the area of appropriate technology. (See Annex III.) Projects being undertaken in the area of appropriate technology by the Council include:

1. Construction of dams to assist farmers in growing vegetables during the dry season.

2. Gari processing equipment to help a women's co-operative processing group.

3. Improved fish smoking and fish curing ovens for another women's co-operative.

4. Production of lye from local materials for soap.

The NCWD representative stressed the importance of giving priority to training in metal work, masonry, carpentry, plumbing, electrical fitting and repairs for village youths in a comprehensive integrated rural development programme in order to assist in maintaining development and appropriate technology projects in the rural communities.

Department of Social Welfare, Ghana

The Department of Social Welfare has done work in home-improving and income-generating technologies to help rural women to supplement their families' income - e.g. soap making, pomade and powder making, making of cane baskets and decorative calabashes, gari and oil processing and weaving. Major devices developed for home improvement include: stoves, ovens and earthenware pots for storing water. The Department has also helped women to establish credit unions to obtain financial assistance for starting group projects.

Home Extension Unit, Department of Agriculture, Ghana

The Home Extension Unit, as part of the agricultural extension service, directs its work to help the farm family, especially through women and youth, to improve their level of living. Three project areas have been identified to help

meet the needs of the farm family:

(a) Nutrition in relation to food production and diet improvement;

(b) Food production, processing, preservation and storage;

(c) Management of resources in the farm and home.

With funds provided from a grant from the United States Agency for International Development, the Home Extension Unit, along with the Home Science Department of the University of Ghana is establishing a series of farmers' demonstration homes. The farm demonstrations homes would provide a place where extension workers and farm families could exchange ideas, try out appropriate technology and learn to identify and solve problems through the maximum use of available resources.

In attempting to introduce appropriate technology and assisting farm families to make best use of their resources, the Home Extension Unit believes that extension workers and technologists alike should never lose sight of the needs of rural families in helping to determine priorities and co-operation between the technologist and the extension work and among related agencies.

Karen Village Technology Unit, Kenya

The UNICEF representative described the Karen Centre which was developed on the conviction that appropriate technology had the potential for indigenous self-sufficient approaches to the problems of low-income families and children. (See Annex III.) The Centre started where the people were and demonstrates over fifty different appropriate technology devices. It uses skills and materials that are likely to be available to low-income rural families. The Karen Centre is the resource Centre for all East Africa. It concerns itself with three major activities:

(a) Demonstration;

(b) Testing and assessment;

(c) Training and outreach.

In the training individuals choose the device in which they want to be trained. Some training programmes also take place on the actual site of the community concerned.

IV. FIELD VISITS

Field visits were made to:

(a) The Catholic Women's Centre, Bo;

(b) The Tikonko Agricultural Extension Centre;

(c) Pa Njigba's Oil Press at Tikonko; and,

(d) Wanjama Village.

After the field trips, participants had the opportunity to discuss their impressions of the sites visited.

The participants toured the Centre and inspected groups doing embroidery, cookery, shorthand and typing. The Principal explained that this school catered for drop-outs from schools, and its aim is to give them vocational training. An inspection was made of the work of the pupils, and members of the team were particularly impressed with the needlework and embroidery.

(a) Catholic Women's Centre, Bo

It was observed that the facilities and equipment in the school were all imported. The participants felt that the girls should also learn to construct and use local substitutes, as very few of them would be able to afford such costly imported equipment after leaving the school. They also felt that publicity of their work was not adequate since people did not seem to know about the Centre.

The Workshop participants wanted to know what happened to the girls when they left the Centre. It was explained that as a follow-up to the school a co-operative centre has been set up to help graduates of the school organize themselves into groups and find markets for the finished products. The Arts and Crafts Centre in Freetown is also being used as an outlet for finished goods. The proceeds from the sale of the products go partly to help the handicapped children around the Centre.

(b) Tikonko Agricultural Extension Centre

The Workshop Manager showed the participants the pedal-operated rice thresher and winnower, blower for blacksmiths, cassava grater, well pumps, seeders, planters, oven/cooker, wheelbarrows and small hand tools. Some of the equipment was developed and manufactured at the Centre whilst others were manufactured from existing designs.

The rice thresher and winnower, blower, cassava grater and others have been sold to farmers and are now in use in the farms of the area.

The main problem stressed here was that of publicity. Many people were not aware of the equipment produced by this Centre. Ways and means must be found to get people to know about the work of this Centre and about the equipment available.

It was observed that the machines were quite expensive for individual farmers to purchase. However, co-operatives of farmers could purchase them for use by its members, or give loans for the purchase of this equipment.

The Workshop participants observed that the use of imported materials raised the cost of the equipment and some people wondered whether it was 'appropriate' to produce this equipment under such circumstances. Attention was drawn to the fact that maximum use was made of wood in all of the equipment and that some of the metal parts were obtained from scrap. Even though the cost of imported materials put up the overall cost of the equipment it was maintained that the fact that no substitute could be provided at the same cost made them appropriate.

(c) Pa Njigba's Oil Press, Tikonko

The group was able to participate in the preparation of palm oil using this press, which was installed by Methodist missionaries about ten years ago. The boiled palm fruits were pounded in mortars and then pressed in the oil press. The palm oil was collected in a pail.

Dissappointment was expressed at the social welfare aspect of the press. The Community Development Officer should teach the villagers maintenance of the machine, especially when visitors were coming. It was evident that some basic education was lacking.

(d) Wanjama Village

The group visited the village of Wanjama, a pilot village for the palm oil press project financed by the UNECA/ATRCW and carried out by the Ministry of Social Welfare and Rural Development in collaboration with the Faculty of Engineering, Fourah Bay College.

The screw-press device, can easily be dismantled for cleaning, maintenance and transportation; it incorporates a boiler for production of steam to increase the yield of oil and is easy to operate. The group watched a demonstration of the operation of the press.

In reply to a question as to whether the press could be simplified, it was explained that simplicity would be at the expense of decreasing the yield, as it was found necessary to incorporate the boiler unit for increased yield.

It was observed that if the fruits were properly boiled the oil wasted in the seeds would be minimal.

It was agreed that comparative studies must be done so that data could be obtained for comparison with other methods.

It was observed that women were not involved in the demonstration at the village and people wondered whether in this case a woman's traditional job had been lost to a man. The social workers should see to it that the women benefit from this press.

It was agreed that for effective implementation of the project the social workers should stay with the villagers for some time to demonstrate the use of the press and convince them of its effectiveness. The engineers were given credit for the design of the press and were urged to further develop it.

V. REPORTS AND RECOMMENDATIONS OF GROUP DISCUSSIONS

For two days of the Workshop, participants broke up into groups for discussion of three topics related to appropriate technology and the rural family. Each group reported on the discussions that ensued.

Group I Topic

Life and Work of Rural Women in Africa, areas of priorities and specific problems of rural families and how the introduction of appropriate technology can assist.

The group defined appropriate technology as any device or method of easing the workload of the rural family and enhancing its quality of life. The technology can be in the form of infrastructural facilities, skills and techniques or machinery. It is dynamic and as such subject to constant review and change.

Rural families comprise between 60 to 80 per cent of the population in Africa and produce a large amount of the economic and agricultural wealth of the nation. Yet they lack certain basic amenities to lessen their workload and enhance the quality of their lives, such as:

(a) Basic infrastructure like roads and feeder roads, clean water supply, sanitation, recreation and health centres.

(b) Education - formal and informal.

(c) Marketing and distribution facilities for their products and adequate credit facilities.

(d) Modern skills and techniques, adequate basic extension services and personnel.

Traditionally the bulk of the workload of the rural family is done by the women, who are faced with multiple roles in the home, on the farm, in the market and in the community. Women's work at home includes child care, nursing, housekeeping, preparation and processing of food, fetching water and fuel, washing and making handicrafts. On the farm women perform the major tasks including planting, harvesting, driving away the beasts and birds, weeding, etc. The woman carries the produce to market, sells the produce while she cares for her small children and buys the family's necessities. In the community, she assists in self-help projects, communal labour and traditional social activities.

Recommendation

In view of the aforementioned, the group recommends the following:

1. Education: Provision of schools in villages and introduction of adult literacy programmes, informal vocational and technical training for rural families;

Education of the rural family to the roles and specific responsibilities of each member of the family, especially the youth and men to participate in some of the tasks performed within the family, for enlightenment in developing awareness of their responsibilities in the areas of nutrition, primary health care, sanitation, social change and innovations, men and provision of more trained personnel to assist them.

2. Basic Infrastructure: More attention to be focused on and financial provision made for adequate infrastructure such as clean water supply, roads, electricity, recreation, health and day-care centres in the rural areas.

3. Marketing and Distribution of Products of Rural Families and Adequate Credit Facilities: Rural families should be encouraged to form co-operatives to enable them to market and distribute their products, purchase raw materials and provide savings and credit facilities for the members.

4. Agriculture: Rural families should be exposed to and involved in the use of modern agricultural methods and appropriate technology; women should be encouraged to participate more in agricultural training programmes. A review should be undertaken of existing laws and practices that hinder the participation of women particularly in the areas of property ownership, marriage, and inheritance. Day-care centres should be established in the rural areas to reduce the workload of women and to provide adequate care for children. Financial assistance should be made available by the Government and outside funding agencies to indigenous scientists and technologists to carry out research on appropriate technology and to produce such technology to ease the drugery of life in the rural areas.

Group II Topic

Review of Technologies for Rural Development.

A. Water

1. Collection

2. Storage

3. Distribution

4. Purification

B. Food

1. Production
2. Processing
3. Preservation
4. Storage

C. Housing

1. Building materials
2. Techniques of construction
3. Maintenance

D. Health and Sanitation

1. Waste disposal
2. Pit latrines
3. Ventilation

E. Communication

1. Feeder roads
2. Transport
3. Educational methods

F. Power-energy

1. Sources
2. Collection
3. Conservation
4. Application

G. Fuel

1. Sources
2. Collection
3. Conservation

This review revealed the difficiencies in existing technologies and led the group to make the following recommendations:

1. Researchers in appropriate technology should observe the following stages in design and development of devices after needs have been assessed:

   (a) Survey of existing technology available to the rural people;

   (b) Research and development work in the laboratory;

   (c) Field testing;

   (d) Modifications based on feedback from field testing.

2. National policy-makers should standardize, wherever possible, all equipment and machinery used in rural areas to facilitate repair and maintenance.

3. Local personnel and users should be involved in the construction of equipment and trained to use and maintain it.

4. Researchers on appropriate technology should devote more effort to devising methods of water collection and storage for domestic and agricultural purposes.

5. Wherever possible appropriate technology devices should be designed to utilize indigenous renewable energy sources for power production.

6. In the design of appropriate technology devices the use of locally-available materials should be maximized.

7. Health authorities should ensure that waste be placed in compose pits to produce manure.

8. Facilities should be provided for radio communication with villagers as one of the means of disseminating information to rural areas.

9. Research and development should be done to design stoves which will utilize non-conventional fuel sources.

Group III Topic

The group discussed the need for co-ordination and co-operation raising the following points:

- That various personnel have their specializations which need to be integrated to derive maximum benefit. The specializations are due to the fact that there are various aspects of appropriate technology, namely:

  (a) Research and development aspect;

  (b) Manufacturing aspect;

  (c) Extension aspect;

  (d) Training aspect;

  (e) Policy and decision-making aspect.

  These may be undertaken by various organizations and therefore the activities need to be co-ordinated.

- All departments and agencies are aiming at the same objectives but they may have different approaches. Therefore, co-ordination and co-operation are necessary.

- Limited resources also make co-ordination and co-operation a necessity.

In order to achieve better co-ordination and co-operation it was considered that there should be an integrated programme in appropriate technology. This should comprise:-

(a) Objectives;

(b) Functions - departments, and organizations which should undertake the various activities;

(c) Implementation - with proper implementation there would be little problem to co-ordination and co-operation. The group felt that lack of co-ordination and co-operation arose from lack of executive powers for an organization to carry out effective co-ordination and co-operation, and disinterest on the part of various organizations and officials to participate in co-ordination.

Recommendations

The group made the following recommendations:-

1. That governments take one of the following courses of action:

   (a) Strengthen a central planning unit in an existing ministry, and empower it to co-ordinate and promote co-operation in appropriate technology activities.

   (b) Set up a completely new body in which organizations involved in appropriate technology are represented. When such a body is set up consideration should be given to subcommittees at provincial and district levels. These subcommittees would work in accordance with the operation of the national unit.

2. Bodies interested in appropriate technology should be encouraged to organize themselves so as to be effective in promoting co-ordination and co-operation. Where appropriate such bodies should be registered under the laws of the State

3. To enhance local co-ordination and co-operation, international co-ordination and co-operation should be encouraged. This could be done through the activities of national associations and international bodies.

VI. SUMMING-UP SESSION AND GENERAL RECOMMENDATIONS

In the summing-up session, it was decided that the time would be best used in coming to some general recommendations for future action. The participants agreed that they would entrust the Secretariat with writing an accurate account of the proceedings in the report.

Before discussing general recommendations, the Chairperson asked Mr. John Spring of the UNICEF, Dakar Office to explain something about UNICEF activities in the countries represented at the Workshop. In particular, she asked him to respond to a question which had been raised earlier with respect to the possibility of UNICEF funding an appropriate technology unit in West Africa similar to the one at Kabete, Kenya.

Mr. Spring explained that UNICEF did not want to commit itself to funding such units until research had been done in respect of identifying ecological and cultural belts so that the units could correspond to the belts identified. For example, he explained that it might be more appropriate to have one unit for the south of Sierra Leone and and Liberia and another one for the north of Sierra Leone, Guinea, and Casamance, rather than to have a unit for Sierra Leone. He said that such research had now been completed and the results published in French in a two volume report. He said he would send participants a copy of this if requested.

Mr. Spring further explained that if UNICEF were to support appropriate technology units in West Africa, they would be fully involved in the project not act only as a funding agency. With respect to a unit at the Bo Training Centre, he said that UNICEF would not be prepared to commit itself to full funding at the moment but that it would be prepared to co-operate with any other agency which started such a unit.

He explained that UNICEF was involved in many appropriate technology projects in West Africa, for example, the well-digging programme in Sierra Leone. Finally, Mr. Spring explained that participants could contact their UNICEF country representative through either the Dakar or Abidjan Office of UNICEF.

Following Mr. Spring's presentation, the participants discussed their priority recommendations. These were listed as:-

1. Training of trainers of women's programmes in the area of appropriate technology.

2. Exchange visits for engineers and other people working on appropriate technology to appropriate technology units in other countries.

3. Setting up of an appropriate technology centre for West Africa.

VII. EVALUATION OF WORKSHOP BY PARTICIPANTS

General evaluation comments made in summing up session were:-

(a) Initial contacts should be made with countries when planning a workshop at least three to six months before it is due to take place.

(b) After participants have been nominated by a country, the organizers should contact them personally prior to the workshop to give more explicit details.

(c) ECA should word its letter of invitation in such a way that participants can ask their own governments for a small amount of foreign exchange to cover minor expenses.

(d) Participants should keep in touch with each other after the workshop.

VIII. CLOSING SESSION

The representative of ECA closed the Workshop by thanking the consultants, participants and observers for their contributions. She explained about the United Nations Voluntary Fund for the Decade for Women which had provided the funds for the Workshop and said that this would be one possible source of funding for follow-up projects.

The representative of the Intermediate Technology Development Group explained how it could assist appropriate technology projects:

(a) In answering technical enquiries;

(b) In providing consultancy services in areas including agriculture, water, building construction, transport, energy and small-scale industries;

(c) Support of national/local appropriate technology institutions including provision of funds for staff to study at appropriate technology institutions in other countries.

A wide range of publications on appropriate technology are available from the Intermediate Technology Development Group (ITDG).

The ECA representative concluded by saying that she hoped follow-up action would be taken in the individual countries and that ECA/ATRCW would be able to assist any projects that might arise.

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ANNEX II

TECHNOLOGIES APPROPRIATE FOR RURAL WOMEN IN AFRICA

by

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Two of the most noticeable trends in African development in recent years have been the realizations that high level technology has been ineffective in meeting problems of poverty and unemployment, and that rural development will fail to accelerate without the increased integration of women in the development process. This paper seeks to explain the reasoning behind these trends and to illustrate how increased emphasis on 'rural technology' combined with greater emphasis on rural women can offer a sound basis for stable, self-sustaining growth in Africa.

Technological Alternatives

It is now agreed that many of the problems currently being experienced in developing countries have been caused, or at least aggravated by earlier development strategies which stressed maximization of output through emphasis on large-scale industries, using modern 'Western' technologies. In general, even if such strategies have produced the desired economic growth, they have also contributed to an inability to create full employment and to a rapid rate of migration from rural areas to the already overcrowded cities. This has occurred mainly because of an emphasis on capital-intensive techniques, a tendency to locate new industries in a few major cities, and a lack of policy measures aimed at generating productive employment opportunities in rural areas. The problems, along with the social misery and loss of human dignity they involve, are becoming more severe. Accordingly it is becoming increasingly clear that any solution must be based on a correction of the past involving new types of technology more appropriate to conditions in developing countries.

The most immediate need is obviously that of the provision of millions of new workplaces, with the majority being created in the rural areas where 80 to 90 per cent of the population of the developing countries still live. There is also a need to improve the quality of life in rural areas by providing or improving the quality of roads, shelter, water supplies, sanitation and health services. Continued dependence on capital-intensive technologies imported from the West is unlikely to provide more than a fraction of the workplaces needed. Also, attempts to emulate the standards of the West by providing, for instance, modern hospitals and individual water connections, will simply increase the standard of living of an already wealthy minority while the majority of people in greatest need receive no benefits at all. On the other hand, traditional techniques, while having a very high labour requirement, are characterized by very low capital and labour productivities and do not generate the surplus needed for rapid growth in capital stock. Similarly, traditional water supplies, sanitation systems and health services, while having little or no direct cost to the community can have an enormous indirect cost in terms of ill-health and diversion of time and effort

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from productive work. This has led to the suggestion that what is needed are technologies which are intermediate between these two extremes.

The concept is simple enough. The creation of a workplace or the provision of a clean and conveniently placed source of water for a village at the intermediate technology level would cost 300 pounds as opposed to 3,000 pounds with high technology and three pounds with traditional technology. Production is more labour-intensive than when high technology is used and more efficient than if traditional techniques are maintained. Besides being sparing in the use of capital, intermediate technology is also sparing in the use of skills, makes as much use as possible of local materials, and caters for local needs such as food, shelter, clothing, water supplies and transportation. Such conditions increase the chances of the technology being successfully integrated into rural communities.

The intermediate technologies would appear to hold much greater relevance for the developing countries than do those imported from the West, and the intermediate approach is one which is gaining increasing support. However, criticisms have been made. The most important of these is that intermediate technology is inferior to high-level technology in the sense that it involves lower levels of output for any given amount of capital and that it creates less surplus and hence restricts the rate of economic growth. Recent surveys of empirical studies[1/] have revealed, however, that in a great many cases small-scale production is more appropriate than larger-scale production under existing conditions, with factors favouring the former including lower transport costs, reduced demands on management, shorter construction time and a minimum of market limitations. Similarly, in agriculture, there is considerable evidence from several countries that animal-drawn equipment or small tractors are preferable to larger ones, shallow tube-wells are preferable to deeper and more costly ones, and small grain or sugar mills preferable to large processing complexes in terms of unit cost, employment generation, requirement of skills for operation and maintenance, and distribution of income.[2/] In these cases the development and availability of an intermediate technology has clearly allowed for a better allocation of resources than would have been possible with existing techniques.

Role of Women in Development

Although increased emphasis on small-scale rural technology may go a long way towards eliminating inequalities between urban and rural areas, and between rich and poor families, there is still another bias which must be corrected if increased rural development is to be realized. In Africa, women form half of the population; 80 to 90 per cent of women live and work in rural areas and 60 to 80 per cent of the agricultural work is done by women. It is obvious, therefore,

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1/ M.N. Carr, Economically Appropriate Technologies for Developing Countries (IT Pubs., London, 1976); G. Jenkins, Non-Agricultural Choice of Technique (Oxford, OUP, 1975).

2/ For specific examples see M.N. Carr, op.cit; G. Jenkins, op.cit.

that the development of African countries cannot be fully realized without the participation of women, that rural development programmes must take into account the role and contribution of women who are the backbone of rural societies, and that high production levels cannot be reached without involving the women who make up a large proportion of farmers and distributors of agricultural products. In addition, health, nutrition, population and education problems cannot be solved without the women who bear, nurture and provide initial education to the children, and who feed and care for the family.

The role of the African rural woman in development is probably best illustrated by emphasizing the varied nature and the importance of the tasks she is expected to perform. She is responsible for better nutrition by increasing output and diversifying the food crops on her farm and improving the nutritional value of the family diet. She is expected to supply fuel and water for the family as well as convey farm produce to the market, to process and store food from season to season, to obtain the best prices and barters at the local markets, to take large measures of responsibility for the welfare of members of the family and, where her husband is absent or dead, for the management of the family as well. In short, the rural woman has the major responsibility for lifting her family out of poverty.

She must usually contend with these responsibilities without adequate education or training. Statistics show that only 38 per cent of primary school pupils are girls and that 84 per cent of female adults (as opposed to 63 per cent of male adults) are illiterate. Girls are rarely taught skills which improve their farming or their management capabilities, and few are trained for gainful employment. In addition, non-formal education given to girls and women often emphasizes cookery, embroidery, sewing and handicrafts, while knowledge and skills in agriculture, animal husbandry, marketing, co-operatives, environmental hygiene, food preservation, family life and other subjects vital for raising levels of living of families in Africa, form little or no part of the curriculum.3/ As a result of this bias in training and because extension services are almost exclusively given to men, women continue with traditional methods and their productivity in agriculture and in income-generating activities remains low. Realization is now growing, however, that improved quality of life in rural areas will be a slow and difficult process unless women are given access to knowledge and the modern means of development which are so often denied them.

Technologies Appropriate for Rural Women

When one considers the multitude of tasks which rural women perform and the limited tools they use in performing these tasks, it is obvious that the introduction of improved technologies holds out the promise of considerable benefits - not just to the women but to rural families as a whole. Varying amounts of work have been done on developing or improving technologies related to crop production and processing, water supply, fuel supply, transportation and most other activities in which rural women are engaged.

For most tasks, there is now a sizeable range of technologies available as alternatives to the traditional methods. For land preparation, for example, there are improved hand tools, animal drawn ploughs, power tillers and tractors. For weeding and fertilizer application, there are many devices of varying complexity

3/ ECA/ATRCW, Women of Africa: Today and Tomorrow (Addis Ababa, ECA, 1975) pp. 23-24.

and costs which can do the job more quickly and in a less back-breaking way than the traditional hand methods. For harvesting, scythes and little knapsack reapers which are powered by small diesel engines or by solar power are alternatives to the traditional penknife. For threshing and winnowing, there are hand-operated and pedal, animal or power-driven machines which can be used instead of the time-consuming and wasteful traditional methods. In addition, there is a whole range of equipment powered in a variety of ways which is designed to grind cereals, polish cereals, grate cassava, shell maize, extract oil from fruits, nuts and seeds, shell groundnuts and palm nuts, pit dates and scrape the flesh from coconuts. There is also a variety of new or improved technologies available to help with on-farm storage of crops and the preservation of surplus foods. For example, simple and cheap solar dryers have now been developed which can be used to reduce the level of moisture in crops prior to storage or to dehydrate surplus vegetables.

With respect to water supplies, there is a whole range of available technologies which can help with the problems of collection, storage and purity of water. Wells can be drilled nearer to villages or can be dug manually on a self-help basis. Streams can be diverted and water piped to villages. Hydrams can be inserted in streams to pump water up to hillside villages. Underground catchment tanks can be built to collect and store rainwater, or water can be collected from roofs and stored in various types of container. Constant experimentation is going on to find more appropriate and cheaper materials for lining wells, constructing pipes and making storage containers. Much work has also been done on development of water-lifting devices which are operated by hand, by pedal power, wind power, solar energy, animal power, or run off engines. Such devices save considerable time and effort involved in pulling up bucket after bucket of water from a deep well.

Normally, water drawn from a well will be much purer than that taken from a muddy river or stream. The water from a fully enclosed well which has a pump will be purer still since the chances of contamination from refuse and dirty buckets are eliminated. Thus, the introduction of a well and a pump to a village will automatically improve the quality of water available for drinking. In cases where water is still collected from contaminated sources, simple water filters made from traditional clay pots and containing layers of pebbles, sand and charcoal, can get rid of many of the impurities.

To help with the fuel supply problem, there are now many technologies which can reduce the amount of firewood or charcoal needed for cooking or heating purposes. Improved stoves which use only two thirds of the amount of wood needed with the traditional "three stones" method of cooking can be built very simply and cheaply from mud and other locally-available materials. A whole variety of solar cookers and solar ovens are available which use no source of fuel at all except the sun's rays. Solar energy can also be used for heating water for washing purposes. Yet another alternative to wood is to use methane gas for cooking or even lighting purposes. A great deal of work is being done on development of both methane digestors and stoves and other equipment which will utilize the gas once it has been produced.

In the field of transport, there are various types of animal drawn carts, hand carts and wheelbarrows which can help women to carry more water, fuel and other commodities in less time and with less effort. There are also various developments taking place in respect of low-cost techniques of constructing rural feeder roads and bridges which can make the marketing of farm and other produce considerably easier.

To all of this, still further technologies can be added which can help rural women. Pit latrines, soak pits and suntables can make the women's tasks of keeping

the home clean and hygiene much simpler. Low-cost refrigeration methods can enable rural health clinics, which can stock needed vaccines, to be located in fairly remote areas, thus allowing women the opportunity of giving their children adequate health care without the necessity of long journeys to the nearest town. Technologies such as kick wheels and improved spinning and weaving equipment can help women to produce their traditional pottery, textiles and rugs more efficiently and raise more income from such work with less effort. Technologies such as improved bee-hives and solar dryers can open up new sources of earning income to rural women through making bee-keeping and food-processing activities simpler and less-time consuming. Low-cost methods of storing rain water and simple water-lifting devices can make activities such as poultry keeping and vegetable growing possible for women who could otherwise not afford the time to collect the quantities of water involved.

There is obviously no lack of equipment designed for use in, or designed to eliminate, almost every task in which the women of rural Africa are involved every day of their lives. The fact that the equipment exists, however, is obviously not sufficient. The most common sight in Africa continues to be that of women walking long distances with heavy loads of water, fuel or other goods on their heads and backs and the most common sound in the villages is still the pounding of grain which goes on and on throughout the early morning and evening. Women continue to be over-burdened and overworked. Yields of food from subsistence agriculture continue to be low. Children continue to suffer from malnutrition and lack of sufficient care and attention. Women continue to be unable to engage in income-generating activities to help out with family expenses because they are fully occupied in underproductive tasks.

The obvious question to ask is why the technologies which do exist are not being utilized to any great extent by the women who are largely responsible for the pace of rural development and who are unable to quicken the pace without access to these improved technologies.

Problems in Implementation

There seem to be three major reasons why rural women in the developing countries are not using new "improved" technologies on a widespread basis.

First, although some technologies may appear to be "appropriate", in the eyes of the technologists and development workers, the people who are expected to use them - the rural women - may not think they are appropriate at all. This seems to have been the case with much of the research into and development of new cooking technologies which reduce the need for firewood. In the rush to save the fast diminishing forests of the third world, the technologists seem to have so far proceeded without any due consideration being given to a number of relevant factors such as the needs and wants of the end users of their products. There has thus been a proliferation of solar reflective cookers which can be used to prepare food without firewood, but which also ignore prevailing customs and conditions in the villages. For example, such cookers must be placed directly facing the sun and have, therefore, to be constantly adjusted as the sun moves. An additional disadvantage is that they cannot support a sufficiently large pot to cook a full meal for a large family. Perhaps the most serious objection to these cookers is that the main meal of the day is usually cooked in the evening when the sun has either gone to rest or has lost most of its strength. In addition, village women in many countries are used to

cooking indoors and are hostile to the idea of moving their stove into the open - and especially into the direct sunlight.4/

Similarly, the proponents of the use of methane gas for cooking seem to have forgotten that production of the gas involves the use of large quantities of water and that in many areas where wood is scarce (e.g. in the Sahel countries of Africa) water is even scarcer. Women are unlikely to see the value of adopting a cooking method which substitutes long walks to collect firewood with even longer walks to collect water and additionally involves collecting animal dung and mixing this with the water.

There are other instances of technologies which may appear to be appropriate in the eyes of their designers but are not so in the eyes of the rural women - who are the ones expected to use them. For example, attempts have been made in West Africa to introduce scythes to help the women with harvesting the rice crop. These were believed to be much more appropriate than the traditional small knife which the women use in a very time-consuming way to cut each stalk individually. The women, however, were reluctant to adopt these implements since they necessitated cutting much further down the stalk, which meant a heavier load to be carried from the farm to the home and caused nasty cuts when they threshed the crop with their bare feet.5/

Also from West Africa come reports of women demonstrating against the introduction of mills for extracting oil from palm fruits. These mills definitely increased the efficiency of oil extraction but since the whole fruit went to the mill (with the male head of the household being given the money for this) the women were deprived of the by-products of processing the fruit (e.g., the oil-containing nut) which they used to keep as payment for their labour.6/

Out of such instances has arisen the myth that rural women are resistant to changes such as the introduction of new technologies. This is obviously a misrepresentation of the true situation. Women who are working up to 16 hours a day to provide the basic essentials of life for their families are unlikely to reject anything within their access which could improve their situation. If they do reject a new technology, it is almost always because it is one which would make the current situation worse rather than better.

4/ Attempts to introduce solar reflective cookers in Ethiopia failed because people believe that standing out in the sunlight causes certain illnesses and skin complaints.

5/ See M.N.Carr "Report on a Visit to Liberia," unpublished mission report, ECA/ATRCW 1976.

6/ See Peter Kilby, Industrialization in an Open Economy: Nigeria 1945-1966. (Cambridge University Press, 1969) pp. 159-165. The fact that the introduction of new technologies can result in a redistribution of income within the household - away from the woman towards the man (who is more likely to buy consumer goods such as transistor radios than more nutritious food or basic essentials for his family) - has become a subject of some concern. See for example I. Palmer "Rural Women and the Basic Needs Approach to Development" International Labour Review, Vol. 115, No. 1. January/February 1977.

Second, it would appear that some technologies have not received widespread acceptance because they relate to a very low priority as far as the rural women are concerned. This applies particularly to technologies such as pit latrines and soak pits which are related to improving the home environment. In most African countries for example, the majority of women immediately state that they need help with carrying water, fuel and farm produce and with processing crops. Very few mention a need for better sanitation. This is well illustrated in the report of a study in Swaziland which pointed out that although the investigators saw sanitation as a problem (with the majority of households using the bush for personal sanitation and disposal of all rubbish) it was rarely mentioned by the people.7/ Obviously, very little success can be expected in trying to introduce new technologies for which people see no immediate need. Pit latrines and other sanitation aids are not unimportant, but they will be met with little enthusiasm at the village level while more pressing problems such as provision of water and fuel remain unsolved.

Third, many improved technologies which are appropriate for rural women are not being used by them because - in one way or another - they are denied access to these. In the great majority of cases, rural women are completely unaware of the existence of improved technologies which could help them. When information does filter down to the village level, it is usually the men who receive it, either because the extension workers are men, or because it is only the men who have time to sit around at organized meetings or demonstrations where such information might be given out.8/

Even when women do learn of the existence of certain technologies, there are further obstacles placed in their way. Women are often denied access to credit facilities because the land and buildings which are needed as collateral are held in the man's name. They rarely have access to advice on how to form themselves into a co-operative and secure a loan through a co-operative scheme.9/ Most rural women could not afford to purchase (even collectively) a grinding mill, an oil-press or a pedal thresher without the help of a loan, and their husbands may see no point in utilising credit facilities to acquire such devices when there is plenty of "free" female labour to do the work.

Before leaving this issue, it should be pointed out that men often do use their access to credit to acquire new technologies when this offers a chance of making quick and easy profits. Most small grinding mills and oil presses in the villages of Africa are owned by men who charge their female clientele increasingly high rates for the use of the equipment. It is a bitter complaint of the poorer

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7/ Fion de Vletter, "The Rural Homestead as an Economic Unit - A Case Study of the Northern Rural Development Area," unpublished study, University College of Swaziland, 1978.

8/ A well-known illustration of this comes from Liberia where a team of Taiwanese farmers were invited to demonstrate the principles of planting irrigated rice. To assure attendance at the demonstration, the Government offered wages to the observers. Many unemployed men participated in the experiment while the women (the ones who do the planting) continued their work in the fields. Source: I. Tinker "The Adverse Impact of Development on Women," Peace Corps Programme and Training Journal, Vol. IV, No. 6, 1977.

9/ Statistics collected by the ECA African Training and Research Centre for Women show that of those people having access to training and advice on co-operatives, a maximum of 10 per cent are women.

women in such villages that they cannot afford such rates and that they have no means of improving their situation by acquiring equipment of their own. Making credit available to rural women's groups or co-operatives would seem to be a very plausible way of precipitating the widespread dissemination of improved technologies and of meeting the needs of the poorest of the poor. To back up this argument, it should be noted that in the few instances when women have been given access to credit to buy improved technologies they prove to be much better at repaying their loans than are men. For example, the Department of Co-operatives in Sierra Leone reported a 100 per cent repayment rate on loans given to women's co-operatives as opposed to a much lower rate for men's co-operatives.10/ Similarly, in Cameroon, all loans given to women's groups in the 1960s to purchase corn mills were repaid to the Department of Community Services within a year.11/

Alternative Strategies

Assuming that the major concern is to help rural women in the developing countries by giving them access to improved technologies which are appropriate to their needs and financial constraints, the problem being faced is not a purely technical one since a large range of technological alternatives already exists - as does the technological expertise to fill most of the remaining gaps. Why then do rural women continue to struggle through their work without the help of improved technologies? At the same time why do so many low-cost technologies designed for use in the rural areas fail to be used on a widespread basis? These two questions are not unrelated. There are three important reasons why both these situations occur.

First, not nearly enough thought has been given to the exact wants, needs and problems of rural women when designing technologies or to the possible consequences for women of using the technologies. It would be interesting to know how many technologists in the developed and developing countries actually ask themselves at the design stage whether their inventions are ones which will be culturally acceptable, will result in less rather than more work for rural women, or will lead to a redistribution of income favourable to the women. Much more socio-economic research needs to be conducted alongside the purely technical research if technologies which are both useful and acceptable to rural women are to be developed.

Second, not enough thought is given to priority needs in specific areas. However, clever, simple or cheap a new technology might be, it will stand little chance of gaining widespread acceptance if it does not meet a priority need. Again more socio-economic research is required so that technologies can be developed in accordance with felt needs. This is obviously more sensible than developing the technology first and then trying to persuade people that they need it.

Finally, not enough thought has been given to how new technologies are supposed to get into the hands of the people who need them. Much more positive action is required in respect of ensuring that information about improved technologies

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10/ M.N. Carr "Report on a visit to Sierra Leone," unpublished mission report ECA/ATRCW, 1976.

11/ E.O. Kelly, Aid and Self Help (Charles Knight & Co. Ltd.), 1979

reaches the rural women and that credit/co-operative facilities are made available to them so that they can purchase such technologies. This is obviously much more difficult to follow through than are the previous two recommendations. It requires, for example, the training of many more female extension workers who can inform rural women about new techniques, help them to form and run co-operatives and - ideally - train women how to operate, maintain and repair any equipment they purchase. This is a fairly long-term and far-from-easy objective.

CONCLUSION

The introduction of village technologies appropriate for rural women is a complex problem and represents a great challenge to the governments and extension workers of African countries. It is one, however, which is worth a great deal more attention than it has received in the past and one which represents a real chance to achieve better living standards for the millions of people who live in the rural areas.

ANNEX III

THE TECHNICAL ASPECT OF THE IMPLEMENTATION OF APPROPRIATE TECHNOLOGY FOR RURAL COMMUNITIES

The Role of the Faculty of Engineering
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by

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ANNEX III

ABSTRACT

The rural family life in developing countries needs to be improved. One of the ways in which this can be done is by the use of various forms of technology specifically designed considering the limitations existing in these communities.

The implementation of these technologies depends on various technical, economic, social and cultural factors. All of these have to be considered before a technology can even be considered for implementation.

This paper considers the technical aspect of the implementation of rural technologies. It points out the main stages through which a project has to pass before it can reach the people at large. Each stage is dealt with considering the researcher, the developer and the user. The problem areas and some of the possible solutions are pointed out.

The work being carried out at the Faculty of Engineering, University of Sierra Leone is described. The various projects for the rural family include the use of waste material as fuel, the development of crop dryers, the assessment and improvement of traditional stoves, improved use of indigenous building materials, solar cookers and stills.

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INTRODUCTION

It is obvious that in developing countries the sophisticated technology imported from more-developed countries often proves to be inappropriate due to factors such as lack of trained personnel, shortage of spare parts and poor planning. Because of this problem there has been a trend over the past years to introduce the so-called "appropriate" technologies in our developing countries.

Many definitions have been given to the word "appropriate". Some people associate the term with technologies which are very basic and serve as the basis for subsistence living whereas another group regards appropriate technology as a dynamic entity. It is seen as a technology which is consistent with the level of technical expertise available and which will improve the social and economic status of the people. In this regard technologies appropriate in 1975 in Sierra Leone may be completely inappropriate in 1980. And, of course, what is appropriate in the city may be completely inappropriate in a small town. With this in mind the author supports the school of thought that appropriate technologies may range from, for example, nuclear energy for producing electricity for lighting to the use of a simple kerosene.

The term intermediate technology is very often used in place of appropriate technology. It is my view that these two words are completely different. An appropriate technology may be intermediate but an intermediate technology is not necessarily appropriate. Consider as an example a device which produces an oil from an agricultural product. This device is available from a developed country and is very expensive but its capacity is what is needed by a farmer. An intermediate device is made, based on the expensive one, out of locally-available materials and is substantially cheaper. Its capacity, due to the manufacturing constraints, is very low and does not meet the needs of the farmer. This is an intermediate technology device but it is not appropriate.

We at this workshop are concerned with the rural family and how technology can be used to improve their overall standard of living. It is appropriate at this juncture to examine the term "rural technology". It is by my definition a technology specifically appropriate to rural life. Thus it could be an intermediate technology, an up-graded indigenous technology or a "bare foot" technology.

There appear to be many people in the area of technology in developing countries who are experts in manipulating words in order to define these various technologies. Many forums are often concerned with discussions about the adequate definitions for the different technologies. Although such an exercise is useful in many respects we must suppress the urge to waste considerable time on these definitions and instead tackle the immediate problems of implementing technologies appropriate for rural families.

The rural family has a cross section of needs. There is the need for food, shelter, clothing, water, health care, income generation from agriculture or other activities, and schools, among others. All of these needs can only be met by utilizing some form of technology which can be satisfactorily understood and used by the rural people.

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The case very often exists where some rural people would like to use a piece of machinery but do not have the skill to maintain it. They feel that the need is very important so that what happens in the future is not considered before spending their money. Many of these needs are at times based on various psychological factors. They feel that to acquire a piece of technology would, for example, uplift their social standing. The rural people may want electricity even though it may decrease their overall standard of living. The cost of electricity may be so high that they may have to reduce their protein intake in order to pay the bills. On the other hand the so-called experts in village technology may feel that the people need stoves made of used oil drums instead of using the firewood and firestones when the people completely have no need for this. The experts may also be so strongly westernized that their judgement may be inadequate to assess the real needs of the people.

The danger in misassessing the need for the technology appropriate to the rural community cannot be overemphasised. It is thus after careful consultation and thought that a satisfactory assessment of needs can be made. It is only after this that a suitable technology can be introduced.

We cannot talk about rural technology without mentioning the role of women. They have the capability to toil throughout the day so as to provide food and generate income for the household and then wake up the next day to carry on with the same task. The work that is being done by the rural woman is time-consuming and back-breaking. Technologies in rural communities must be improved to at least make life a bit easier for women so that they can concentrate a bit more in improving themselves, for example, by learning to read and write.

This paper is concerned with the technical aspect of implementing appropriate technologies in rural communities and what the Faculty of Engineering at Fourah Bay College, University of Sierra Leone is doing in this area. We shall point out some of the factors which should be considered during the various stages of implementing technology at village level and how these factors affect the success or failure of a given technology.

INDIGENOUS TECHNOLOGIES AND THEIR DEVELOPMENT

Identification of Indigenous Technologies

Every rural community has technologies which have been used for many years. An important aspect in the introduction of a suitable technology is to know exactly what exists in the community. It would be a waste of time and effort to bring in a technology which is not needed by the community.

There should be a national or regional survey of all indigenous technologies before any serious implementation programme is initiated. This survey should have a cross section of professionals including sociologists, scientists, engineers, economists and doctors. There should be adequate planning and finances to carry out this survey which will be the basis for future work. The survey should also include the assessment of the needs of the people in terms of, for example, energy requirements for cooking and agriculture or equipment for

various processing activities. The results of such a comprehensive survey should then be carefully compiled and circulated within the country to the various institutions concerned with developing technologies at the rural level.

An important factor to consider is the people participating in the survey. They should be trained so that their interviews with people would bring out what is required. Their job would involve analyzing a wide spectrum of technologies ranging from soap making, tapping, gari production to palm oil pressing and using herbs for healing. They must therefore have some scientific background in order to ask the relevant questions and make the right observations. During such a survey, photographs must be taken of any equipment or stages in a process so as to have a visual record of the interview.

The analysis of the data should be done in such a way that the final arrangement of the findings would easily be understood by even a lay person. The reason for this is that if certain funding agencies are interested in a particular technology they would turn to the appropriate topic and extract the information they need. Also researchers and development workers would have an easy time finding just what they need instead of reading the whole report of the findings. Such an aspect is considered an important factor in assessing the value of such a survey.

The results of a survey on indigenous technologies should identify processes and equipment used for various activities. The areas for further analysis of these technologies should be clearly identified with the aid of experts in the various fields. For example in the processing of soap, the chemist's expertise must be sought to identify what must be done in the area of research and development so that a better product might emerge. In the case of medical care using indigenous methods doctors must participate in pointing out the various areas of further study and how collaboration could take place between the "medicine man" and the medical doctor. It is only by this wide spectrum of involvement that such a survey can be valuable.

RESEARCH AND DEVELOPMENT ACTIVITIES

The identification of areas for further work is only a starting point for future activities by the appropriate personnel. The research and development worker would then chose an area of interest or of primary concern and initiate a programme of study.

There is a tendency for people to take an indigenous technology, improve on it and introduce it to a village. This method is not useless but does not in the long term help the basic problem existing in the community. Since, by my definition, appropriate technology is dynamic, a change will be required sometime in the near future. For this reason the problem must be tackled at its roots. Any item of technology which needs further development should first of all be studied in an analytic manner. All the variables which affect its effectiveness should be identified and isolated as well as possible. For example, in the case of traditional weaving, one cannot introduce a metal loom instead of the wood one currently in use without giving concrete scientific support for the substitition. We must ask ourselves certain questions about whether there is adequate tension in the threads to give a good product, the strength of the thread used, the durability of the wooden parts and the effect of the width of the finished product. These questions can be answered only by detailed scientific work in the laboratory. Research is as necessary in introducing technologies to the rural people as the

acceptance of these technologies. There have been many instances where a little bit of time and money spent on research would have prevented the total rejection of a particular technology by rural communities.

The research activity should not be separated from the people who will benefit from the results. During all phases of a research project of this type, the worker must liase with either the community by personal contact or through an appropriate government ministry. There should be discussions with the rural community about the work in progress in order to generate their interest. If this is done effectively then discussions often reveal certain details which might have been missed by the researcher or which would accelerate the work in the right direction. An example of this is work carried out on crop dryers at the Department of Mechanical Engineering in the Faculty of Engineering. During the research stage, the people are asked questions and their comments about quality of the final product are solicited. The time, for example, to dry in the open air about four square metres of small peppers would vary in various locations depending on the solar insulation. A crop dryer working well in Freetown may not work satisfactorily in Bo. Thus discussions between the people in various regions could give ready information regarding sizing of equipment and design criteria during the research stage.

Both the research and development aspects of implementing village technology are often carried out simultaneously in some cases, whereas they are separate in other instances. There are also stages in a development programme when pure research is needed to answer a pressing problem without which the prototype cannot be made. Proponents of "just making things which work" should review their trend of thought just as the Concorde flying now was based on a tremendous amount of research and development activities.

The development stage of any technology is the time for close association with the prospective user. Their opinions about the particular technology must be obtained since the whole work is unsuccessful if it is not accepted. Care must be taken to use locally-available materials as much as possible and to minimize the cost. This aspect in the development work does not need further amplification since we are all aware of the economy and problems with foreign exchange. Perhaps these constraints may make us develop our natural resources to the fullest extent, relying only on imported goods to a limited extent.

The cost of a system is of importance. However, it should be realized that an efficient system can only at times be designed or a process perfected with minimum requirements. The requirements may be a copper plate, chemicals not available locally or even a relatively sophisticated item such as an integrated circuit. Does this then prevent the development of the technology? Does it mean that a rural technology must always be very cheap? Should we not make them in developing countries? Such are the questions the technical expert is confronted with in trying to implement certain technologies at village level. Thus, although it is felt that low cost is very important, there are certain instances where the social benefits have to be considered, for no country will develop if everything being used is low cost. The villages should one day become small towns, and we cannot achieve this if the technological capacity is not developing.

In order that technologies be of benefit to the rural communities, the people must be capable of operating systems and handling processes themselves. The research and development stage must take this into account. There have been cases in many countries where imported technologies have proved ineffective as the expertise to man them did not exist. Such cases should not occur in developing countries where the idea of imported goods being good and locally-made goods being inferior prevails, for if a locally-developed technology is ineffective for one reason or another this unfortunately confirms the belief of the people. The developer of any technology must ensure that the system being developed can be operated by people at the village level on a daily basis. Any major problem can be dealt with by someone from the village who is specially trained.

FIELD TESTING AND WIDESPREAD USE OF TECHNOLOGIES

Field Testing

The technology that has been developed is ready for testing after satisfactory laboratory experiments have taken place. It is not absolutely necessary to have a perfect technology before trying it out in the field.

The site for testing the prototype in the case of equipment is extremely important. The investigator may for lack of resources only wish to test the equipment at very few locations. These locations must present conditions under which the system is expected to operate. The village people whom the system is expected to serve should participate in its operation. Some problems which occur under such field testing is that people who may not be interested in the technical aspects of the programme fail to realise the reasons for some precautions. In fact it is under these settings that the most beneficial data can be obtained as the results tell the developer what is the level of success of that technology.

Another point concerns the prospective users. They usually tend to be impatient with the rather long-winded procedures involved during testing. For example, they do not see the importance of measuring the weight of kernels before and after use in a palm oil press. These necessary procedures tend to turn off some people. For this reason, the technical personnel have to explain every step of the testing procedure to the users so that they can appreciate its necessity.

The testing programme should whenever possible be compared to the traditional process. There should be an unbiased evaluation of the results. Many users of traditional technologies tend to be very rigid and resist any change. They will not look at the data objectively. For example, they may say that the taste of the particular product using the new technology is not as good as the old one. They may even fail to see a saving in time and money that the new technology has to offer. Take the example of people who have been used to drying a bag of pepper under the sun by spreading it on the ground and taking

three to five days in the drying. Suppose a crop dryer is used for the same quantity of pepper and it takes two days, but the drying takes place in three batches. Some of the users of the crop dryer would categorically tell you that the process of drying took too much of their time to load and unload the dryer, forgetting the time they spent using the traditional process. Of course this problem can be solved by designing a larger capacity dryer, but then the users will say it is expensive and will not be interested in buying it.

All of this shows that the technical aspects of implementing rural technologies are not separate entities. Rather they are a cross between the social and economic aspects of implementation. It is only by a careful research development and testing that a technology can then undergo the next step, which is widespread adoption.

Widespread Use of Rural Technologies

This area is a very tricky one which involves more than just technical success. It has been assumed up to now that there would be adequate financial resources to carry out the research, development and field testing programme.

In the case of widespread use of a successful technology there are factors such as political, financial, and managerial attitudes which could make or break the venture. The technical aspects are not as complex as the others and will only be considered here due to the nature of this paper.

Some of the major aspects that have to be looked into carefully are patent rights, production capacity, unit cost, quality and durability of the product, maintenance and warranties.

Frequently even in a locally-developed technology, some of the materials have to be imported. The production enterprise has to find ways of solving the import problems perhaps by applying for special privileges from the government. The unit cost would depend on the set-up of the business and the demand.

The maintenance of systems needs to be provided for by the manufacturer. There should be a quick response to the needs of the user as without this disillusionment will occur, thus decreasing sales and causing poor business. Spare parts must be readily available and minor repairs should be within the technical capability of the village craftsman if possible. Widespread adoption can fail even though the technology is sound and is accepted by the people. Care has to be taken so that the rural community will benefit from this aspect of the implementation programme.

ANNEX III

THE ROLE OF THE FACULTY OF ENGINEERING

The Faculty of Engineering is situated on the Fourah Bay College campus. It consists of three separate Departments: The Departments of Civil, Mechanical and Electrical Engineering. Although each Department organizes its own research and development programme, a body exists in the Faculty which co-ordinates these activities. This body, Advisory Services in Technology, Research and Development (ASTRAD), has been active for many years. It provides consultative services to the public at large, designs and manufactures spare parts which otherwise would have to be imported, and carries out research and development in various areas of engineering. An appropriate technology group exists within ASTRAD which specifically works on projects in this area.

The work currently being carried out in appropriate technology in the various departments fall under the following categories:

a) Solar energy applications;

b) Local fuels and their uses;

c) Mini hydro-electric power generator;

d) Development of processing equipment;

e) Local earthing materials;

f) Building materials;

g) Refuse disposal;

h) Water resources;

i) Transportation;

j) Mechanical power production.

Summary of Activities

The availability of solar energy in Sierra Leone justifies its use as a fuel source. Research and development being carried out in the Department of Mechanical Engineering is presently concerned with passive systems such as crop dryers, water heaters, cookers and stills.

Solar Water Heaters

Various designs of solar water heaters have been devised and tested over the past years. The emphasis has been on low cost, ease of manufacture and the use of locally-available materials. These materials are relatively expensive

even though their thermal properties are not the best available.

The work presently being carried out is aimed at developing marketable designs for local use. Thus attention is focused on the use of available materials with the best thermal properties and also on manufacturing techniques which can be adopted on a large scale.

The programme involves the survey of the level of need for solar water heating, the variation of hot water demand with the various seasons, the durability of the water heaters and their performance under normal household conditions. Many designs will be evaluated after which a model will be installed in a home to evaluate its effectiveness under normal working conditions. The final stage will involve getting entrepreneurs to manufacture and sell them.

Solar Cookers

Work is being carried out on cookers which can be used indoors. A cooker using steam for cooking has been built and is undergoing tests to evaluate its efficiency. The results indicate that this type of cooker can be used for slow cooking. Work is also being done to design another type of cooker which is intended to produce high temperatures for frying. It is felt that this is the direction solar cooking should take, i.e. for indoor cooking in order to have an impact on family life.

Solar Crop Dryers

There are presently two projects involving crop dryers. The first is concerned with research aimed at developing a crop dryer which uses sawdust and solar energy as fuels. The system being developed uses both fuel simultaneously or individually. For example, during periods of high intensity of solar radiation there may not be any need to use sawdust as an auxiliary source of heat. However, during cloudy periods, at night or in the rainy season, when there is little solar radiation, the sawdust can be used to produce the heat needed for drying. The project is now at the construction stage after which the testing phase will start. The results of this study will lead to recommendations being made concerning what crops can be effectively dried using such a dryer.

The other research project on crop dryers is aimed at using solar energy for drying crops which are of major importance. The crop dryers will be particularly developed for use in rural areas where there is no electricity supply and the income of the average farmer is relatively low. Thus the dryers will operate under natural convention conditions since there will be no electric fan for circulating the heated air. This project will involve continuous liaison with the rural farmer during all phases so that the developed system will have inputs from the people using them. The project, now in its initial stage, should be completed in about two years.

Local Fuels and their Uses

The work done in this area is aimed at identifying locally-available materials which can be used as fuels, establishing the viability of using these

fuels by determining their quantities and investigating the conditions under which they can be burnt, and developing various systems which can effectively use them.

Studies have been carried out to identify various solid fuels. Some of these fuels, which include deposits of lignite, various species of wood from bushes, waste from sawmills in the form of sawdust from different trees, coconut shells, and rice husks, have had their calorific values measured. In cases where the fuel is usually available in various wet states, the variation of their heating values with moisture content have also been determined. Further work is in progress to carry out similar studies for other fuels which can be identified.

An extensive study is in progress to investigate efficient methods of burning some of the fuels which have been identified. Fuels which are available in the form of dust, for example, wood sawdust, have been studied to determine the effects of various factors on their burning rate and amount of heat liberated. The results of this work have been used to design sawdust burners for various applications as outlined below.

Work is in progress to use waste sawdust in an integrated solar-sawdust crop dryer. A major part of this project is the conversion of the heat from the sawdust to useful heat for drying. Another application of the results of the sawdust study is its use in a fish smoker/dryer. A prototype has already been manufactured and tested under load and no-load conditions. The results so far indicate that the smoker/dryer can dry fish three times faster than the traditional method. A larger quantity of fish can be dried with relatively little attention being given during drying compared to the traditional process. Temperatures ranging from low values to over 200°C can be achieved, the magnitude depending on the design of the dryer. Another ongoing project on the use of sawdust as a fuel is concerned with its application as a heat source in ovens. The oven is presently being designed and performance testing will get underway shortly.

Charcoal can be safely given a second place as a domestic fuel in Sierra Leone. There is however a substantial amount being wasted when used as fuel in homes. As a result of this a study is in progress to develop improved appliances using this fuel. A preliminary investigation has been carried out on the performance of existing traditional cookers. It is noted that the efficiency of these systems is about 10 per cent although the shape of the various cookers affect their efficiencies. Also of interest was the effect of grading the charcoal on the performance of the cookers. Although the results are so far not conclusive there are indications that the size of the fuel may be an important factor to consider in future designs. Further work is in progress to enable more efficient use to be made of this important fuel.

Mini Hydro-electric Power Generation

This project recently initiated plans to set up a pilot small-scale hydro-electric generating plant in a rural environment. The team working on this project consists of members of all Departments of the Faculty, in view of its multidisciplinary nature.

Investigations are underway to identify suitable sites for the pilot plant, and there are also discussions with interested external agencies about support for this work. It is envisaged that this work will generate enough interest for use to be made of the vast hydro-electric potential of our rivers and streams.

Development of Processing Equipment

There are various traditional methods of food processing which need immediate attention if improved food quality and quantity are to be achieved. In this regard work has been done to improve the processing of palm kernel, a fruit with a soft outer skin and a nut inside covered by a hard shell. The soft outer skin has high nutritive value and the oil (palm oil) which is obtained from it is used by nearly every household in Sierra Leone on a daily basis. The hard nut of this fruit is also used to produce an oil (paml kernel oil) which is also used for cooking and the manufacture of various cosmetics. The development work has concentrated on the design of presses to get the palm oil and a nut craker to separate the nut from the hard shell.

Various prototype palm oil presses have been tested over for some years but they have not been widely adopted, mainly due to lack of funds to do extension work testing. The latest design has, however, found some acceptance in the rural areas. This palm oil press is small, relatively light and can therefore be easily transported. It has a small boiler which greatly increases the output of palm oil during pressing. This press was recently demonstrated during a workshop organized by the Department of Mechanical Engineering for personnel of the Ministry of Social Welfare and Rural Development who will be involved in a study using these presses throughout the country. This close collaboration between the University and the Government in such an important project should stimulate the interest of entrepreneurs to invest in these presses, allowing the quantity of palm oil employment to increase.

A prototype palm kernel cracker is also being developed to separate the nut of the palm kernel from the hard shell. It uses centrifugal forces to crack the hard shell open, thereby obtaining the nut. The tests already performed show that about 90 per cent of the nuts are obtained whole. Further developments are underway to use other sources of power apart from electricity.

Another project on processing equipment is the development of spinning and weaving machines in Sierra Leone. This work is in the initial stage which is to identify areas for the improvements of the existing traditional systems.

Local Earthing and Insulating Materials

A study of the resistance of soils is being carried out to assess the effectiveness of earthing in these soils. Soils in the western area of the country have so far been studied. Methods which are being investigated for improving the poor conditions, which occur particularly in the dry season, include wetting the electrodes with salt water and embedding them in charcoal.

In another study, local hardwoods have been investigated for their insulating properties. Their dielectric properties have been investigated. Further work is in progress to study the properties of sawdust and backed clay.

ANNEX III

Building Materials

This area of work is of major importance in our country where the cost of imported material for building is rapidly increasing. The projects carried out should eventually contribute to alleviating this situation.

The binding properties of locally-occurring natural material and wastes are being studied in order to establish local substitutes for portland cement. Studies have been initiated into the bonding in laterite rocks and into properties of lateritic cement manufacture by burning lateritic clays under controlled conditions. These investigations are carried out in parallel with studies of the pozzolanic properties of industrial and agricultural wastes such as crop shells.

A study of sandcrete blocks is also underway to assess the effects of curing and testing procedures on their strength. Sandcrete is a popular building material which has been used throughout West Africa for a long time. Despite its common usage, proper control and specification for these blocks still does not exist in most countries. A systematic study of the properties of sandcrete blocks which seeks to establish data for the drawing up of a code of practice for Sierra Leone is therefore in progress.

Laterite is a material which occurs extensively in tropical regions of the world. Earlier work has established that the hard rock faces of the lateritic outcrop can be used as coarse aggregate in concrete provided certain precautionary measures are adopted. Studies are continuing into the fundamental properties of the rock with a view to establishing guidelines for their use in both reinforced and prestressed concrete construction.

There is also work in progress on the more efficient use of timber as construction materials. The strength of various types of timber are being studied under various conditions.

The use of clay as a building material is developing in Sierra Leone. A study on the clay deposits in the Koya District of Sierra Leone is in progress. Bore holes eighty-feet deep have been drilled in various strategic locations and samples taken at one-foot intervals. Chemical and other tests are in progress.

Refuse Disposal

There is presently a great need for safe refuse disposal systems in this country. The University has initiated a study of cheap and effective refuse disposal systems for local use. Preliminary work has been done to assess various alternatives which can be used as pilot studies at the Fourah Bay College campus. Two possible systems have been identified and are presently being studied as pilot projects.

Another study on refuse disposal is concerned with the management problem of collection and disposal in the city of Freetown. Data relevant to this study has been collected and analysis of it is in progress.

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Water Resources

Water supply in high level areas is being investigated with a view to recommending alternate sources of water for these areas. Analysis of data is in progress. Other projects on water resources are studies on flood routing of large dams and water balances of selected water sheds in Sierra Leone in order to determine suitable locations for dams.

Transportation

In this study models have been developed for determining latent demand for urban transportation under different socio-economic conditions.

CONCLUSION

An attempt has been made to outline various technical aspects of the implementation of rural technology. The main steps involved are:

a) Survey of indigenous technologies;

b) Research into their operation;

c) Improvement of the indigenous technologies or replacement by research and development activities;

d) Limited field testing and modification;

e) Widespread adoption.

It has been noted that it is not easy to separate the technical aspect of implementing rural technologies from the social, economic and cultural aspects. There has to be an integration of all these activities if the programme is to succeed.

The Faculty of Engineering at the University of Sierra Leone is concerned with developing technologies for rural people. There are various projects being carried out in all the three Departments of the Faculty which have a potential of affecting the life of the rural family. For successful implementation of these projects the financial support has to be available.

ANNEX IV

PROMOTION OF TECHNOLOGY FOR IMPROVEMENT OF RURAL LIFE IN GHANA

by

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INTRODUCTION

Technology is the application of scientific knowledge to the solution of practical problems. Humans have always combined skill and science to devise means of solving problems.

In recent times the adaptation of available resources to create techniques and tools which are consonant with one's circumstances has given rise to the term appropriate technology. When the technology relates to village or rural development it is often referred to as village or rural technology.

The appropriate utilization of technology for the improvement of rural life has been given considerable attention lately in Ghana. Efforts have been made by various national and international organizations to promote technology for improvement of rural life through research, development, extension and training. The writer has been involved in some of these efforts and in attempts to achieve co-ordination and co-operation in promoting appropriate village technology.

As a lot of efforts by various organizations overlap it would help reduce duplication of efforts if available information on utilization of technology for improvement of rural life is assembled. This paper therefore reviews some of the efforts at promoting technology for improvement of rural life with particular reference to Ghana.

Research and Development

Research and development in the field of science and technology have resulted in the production of devices, equipment and structures for use in the rural home and community and on the farm. Research and development have been carried out by adopting or improving the traditional indigenous technology, accepting or adapting a scientific modern technology, reviving an old technology, transferring a known

technology or developing a new technology. Elements of these approaches may be combined to achieve a desired product.

Devices for the Home

A number of devices have been developed, constructed and introduced for home use to reduce drudgery in and time for food preparation, preserve and store food, improve the environment and aid in child care. The establishments which have been involved in developing, constructing and introducing the devices include the following:

Department of Social Welfare and Community Development

Home Extension Unit (Ministry of Agriculture)

Home Science Department (University of Ghana)

Ghana Home Science Association

Ghana Assembly of Women

National Council on Women and Development

A list of some of the household devices and their uses are presented below:[1/]

Device	Uses
Smokeless stove	Provides smokeless cooking station
Calabash wash stands	For washing hands and plates
Kerosene tin oven	Used in place of smokeless stove for baking cakes and biscuits
Oven dryer	For smoking fish and drying vegetables and cassava chips
Fufu machine	For pounding fufu
Kitchen shelves	For utensils storage; for drying when built over oven
Iceless coolers	For cooling produce
Solar dryer	For drying vegetables
Nest of beds	Three-in-one bed used as settee during the day
Bamboo cots and play pens	Contain baby when asleep or at play
Soak-away pits	Have bamboo tables for laundry and dishwashing.

1/ D.B. Ampratwum (1979), "Appropriate technological devices for use in the home, community and farm." Paper presented at the Ghana Home Science Conference,

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Equipment for the Community

Equipment developed for community use are for food processing and small-scale industrial operations. These include small-scale industrial dryers, smoking ovens, cassava graters and presses, oil palm presses, nut crackers, sugar extraction plants, caustic soda and soap production plants, broadloom weaving units, water tanks and pumps.

Most research and development work have been on dryers and graters as shown below:

Equipment	Developed at
Village crop dryer	Food Research Institute, Accra
Cabinet crop dryer	Food Research Institute, Accra
Wadhwa cassava grater (diesel)	Agricultural Engineers Ltd., Accra
Prototype cassava grater	University of Science and Technology Kumasi
Tractor mounted cassava grater	University of Ghana, Legon

Equipment and Structures for the Farm

Various equipment and structures have been developed for the farm for use in field operations, on-farm processing, drying, handling, storage and irrigation. These include the following:

Equipment/Structure	Developed by
Ox Ploughs and donkey carts	Christian Service Committee
Ridger-cum-planter for scassava	Ministry of Agriculture, Pokoase
Corn dryer	University of Ghana, Legon
Vermin-proof grain silo	Ghana-German Agricultural Development Project Group
Irrigation pumps	University of Science and Technology, Kumasi

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Extension and Training

Almost all the establishments mentioned earlier are involved in extension and/or training as it relates to adoption and proper utilization of products developed for rural communities.

Through extension programmes various devices, tools and equipment are introduced to rural communities. Training may take the form of educating rural people in the application of a particular technology or proper use of a technological device. On the other hand it may involve the training of rural workers.

Some Specific Activities

The writer has been closely connected with activities of the Division of Agricultural Engineering of the University of Ghana and the National Council on Women and Development aimed at promoting technology for the improvement of rural life. A summary of some of the activities is given below.

Division of Agricultural Engineering, Legon

Since 1962 the Division of Agricultural Engineering, Faculty of Agriculture, Legon, has been involved in a programme of developing and testing technological and engineering methods and equipment. The Division over the years has designed, developed and/or tested equipment relevant to Ghana's agriculture and rural life. These include:

1. Hand-operated maize shellers fabricated from iron pipes and metal plates.

2. Tractor-mounted cassava graters which can be easily moved from place to place for grating.

3. Testing of mist sprayers for the cocoa industry.

4. Grain dryer development and testing.

5. Oil palm press/nut cracker and water pump fabrication.

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Current research and development projects of the Division directed towards application of technology to Ghana's agriculture and rural life include:

1. Further development and fabrication of maize shellers for extension work.

2. Development of solar grain dryers.

3. Improvement of farmer-level grain storage.

4. Further development and evaluation of oil palm nut crackers and water pump.

National Council on Women and Development

A programme on appropriate technology has been initiated by the National Council on Women and Development. The programme is aimed at identification of appropriate technologies which will alleviate the time constraints on women particularly in rural areas and assist them in productive activities. The Council, acting on recommendations from a survey conducted in 1976, is engaged on the following aspects of appropriate technology with particular reference to women:

1. Collection and dissemination of information.

2. Coordination of activities.

3. Undertaking of pilot projects and research.

The Council is involved in the establishment of Common Service Centres where groups can make use of facilities provided to expedite agro-rural industrial production. The major projects of the Council based on the Common Service Centre concept include:

1. Processing of cassava into gari at Kafi Kumasi.

2. Production of potash for soap-making at Kwamoso.

3. Weaving of baskets and bread bowls at Dabala.

The Council has a research programme which touches on all aspects of not only rural life but also urban life. The Council's research on technology application involves identification of appropriate technologies to assist women's activities in particular and improve rural life in general.

Co-ordination and Co-operation

In September 1977 a seminar on co-ordination and co-operation in promoting appropriate technology for home and village improvement was held at Legon under the auspices of UNICEF (United Nations Children's Fund) and the University of Ghana.

The activities of the various Ghanaian organizations which participated in the seminar and some sources of financing for their activities are shown below:[2/]

Organization	Major Activity	Funding Agency
Department of Social Welfare and Community Development	Extension, training	UNICEF
Ministry of Education - Ghana Education Service	Training	UNICEF
Ministry of Health - Home International	Extension	Home International
National Council on Women and Development	Extension research	UNICEF, USAID, ECA
Ministry of Agriculture - Home Extension Unit	Extension training	USAID
Ghana Assembly of Women	Extension	USAID
Ghana Home Science Association	Extension	International Planned Parenthood Federation (IPPF)

2/ University of Ghana/United Nations Children's Fund, (1977). Co-ordination and co-operation in promoting appropriate village/home-improvement technology in Ghana. Report of a Seminar held at the Faculty of Agriculture, University of Ghana, Legon.

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Organization	Major Activity	Funding Agency
Food Research Institute Council for Scientific and Industrial Research (CSIR)	Research	Council for Scientific and Industrial Research (CSIR)
Home Science Department, University of Ghana	Research, Training	USAID
Agricultural Engineering Division, University of Ghana	Training, Research	University of Ghana
Technology Consultancy Centre, University of Science and Technology (UST)	Extension	University of Science and Technology

Though some of the organizations co-operated with other organisations in their activities, co-ordination was rather within a particular organization The writer has been involved in activities to undertake a national co-ordination programme but efforts have so far not yielded concrete results.

CONCLUSION

Various efforts are being made to promote technology for the improvement of rural life in Ghana. There is, however, a great need for co-ordination and co-operation in the context of a national rural technology programme.